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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/681,308	10/09/2003	Jin Li	M4065.0965/P965	7977

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EXAMINER	
HARRINGTON, ALICIA M	

ART UNIT	PAPER NUMBER
2873	

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H·A

Office Action Summary	Application No.	Applicant(s)	
	10/681,308	LI ET AL.	
	Examiner	Art Unit	
	Alicia M. Harrington	2873	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27,29-45 and 56* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27,29-45 and 56* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. This application will receive a news grounds of rejection for the amended claims and claims 17-23 that the Examiner inadvertently did not include in the previous rejection.

Election/Restrictions

2. Applicant's election without traverse of claims 1-45 in the reply filed on 11/12/04 is acknowledged.

3. Claims 46-55 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 11/12/04.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 10 and 29 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 6 was amended to recite, " first micro lenses at least abut without overlapping said second and third micro lenses". Claim 10, which depends from claim 6, recites "second micro-lenses overlaps surrounding ones of the first micro-lenses". The Examiner is unclear as to applicant intended for them to overlap or not overlap. Thus,

applicant fails to particularly point out and distinctly the subject matter applicant regards as the invention.

Claim 24 was amended to recite, "said second micro-lenses abuts without overlapping at least one of the first micro-lenses". Claim 29, which depends from claim 24, recites "second mirco-lenses overlaps surrounding one of said first micro lenses". The Examiner is unclear as to applicant intended for them to overlap or not overlap. Thus, applicant fails to particularly point out and distinctly the subject matter applicant regards as the invention.

Claims 10 and 29 will be not be treated on the merits.

6. Claims 17-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "at least approximately" in claim 17 is a relative term which renders the claim indefinite. The term "at least approximately" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The claim sets forth a limitation of "at least approximately space-less" and the Examiner is unclear as to the bounds or degree to which the lens array is space less. Thus, applicant fails to particularly point out and distinctly the subject matter applicant regards as the invention.

The term "at least approximately" in claim 21 is a relative term which renders the claim indefinite. The term "at least approximately" is not defined by the claim, the

specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. The claim sets forth a limitation of "at least approximately space-less" and the Examiner is unclear as to the bounds or degree to which the lens array is space less. Thus, applicant fails to particularly point out and distinctly the subject matter applicant regards as the invention.

Claims 18-20 and 22-23 inherit their indefiniteness from claim 17 from which they depend.

Claims 17-23 will be examined as best understood by the Examiner.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-9,11-16,36-39,40-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shizukuishi (US 6,734,031) in view of Tokumitsu (US 5,238,856).

Regarding claim 1, Shizukuishi discloses a micro-lens array, comprising:

a first set of micro-lenses comprising a plurality of first micro-lenses (for example **12G**) each having a first size (see col. 4,lines 3-10 and 40-52; col. 5,lines 5-12; col. 11, lines 35-45; figures 1a and 3); and

a second set of micro-lenses comprising a plurality of second micro-lenses (for example **12 B)** each having a second size (see col. 4,lines 3-10 and 40-52; col. 5,lines 14-17; col.II, lines 35-45; figures 1a and 3);

wherein at least one of said plurality of first micro-lenses at least abuts at least one of said plurality of second micro-lenses (see col. 3, lines 55-63; col. 5,lines 5-12 and col. 6, lines 5-10). Shizukuishi patterns the lenses in the form to cover as much area on the array as possible. Shizukuishi illustrates the lens contact each other and some overlap. However, Shizukuishi fails to specifically disclose an embodiment where the lenses abut without overlapping as claimed.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lenses are patterned on the substrate to abut such that first and second lens, which are spectrally different, will contact (see col. 5, lines 25-65 and col. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hokari, as taught by Tokumitsu, since Tokumitsu teaches a pattering method for forming the micro lenses that contact without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 2, Shizukuishi discloses the micro-lens array of claim 1, further comprising a third set of micro-lenses (for example **12R**) comprising a plurality of third micro-lenses each having a third size (see col. 5, lines 14-19 and col. 11, lines 35-45).

Regarding claim 3, Shizukuishi discloses the micro-lens array of claim 2, wherein said first, second, and third sizes are equal to each other (Shizukuishi teaches the micro lenses are only spectrally differentiated-see col. 11, lines 35-45).

Regarding claim 4, Shizukuishi discloses the lens array is only differentiated by a spectral characteristic (transmission of certain wavelengths) and sensitivities of the lens can be adjusted (see col. 11, lines 38-45). Shizukuishi fails to specifically disclose the micro-lens array of claim 1, wherein a focal length of each of said plurality of first micro-lenses is approximately equal to a focal length of each of said plurality of second micro-lenses.

Tokumitsu teaches that the focal depth is dependent upon lens curvature (see col. 6,lines 1-15). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made that focal lengths of the first and second are approximately equal, if the lens array curvature is not differentiated and the pixel sites are at the same depth (assuring each lens focuses light onto the pixel sight and not in the layers-loss light).

Regarding claim 5, Shizukuishi discloses the lens array is only differentiated by a spectral characteristic (transmission of certain wavelengths) in one embodiment but in another embodiment the sensitivities of the lens can be adjusted (see col. 11, lines 38-45). However, Shizukuishi fails to specifically disclose the micro-lens array of claim 1, wherein a focal length of each of said plurality of first micro-lenses corresponds to a first wavelength of light, and wherein a focal length of each of said plurality of second micro-lenses corresponds to a second wavelength of light.

Tokumitsu teaches that the focal depth is dependent upon lens curvature (see col. 6,lines 1-25). Tokumitsu also teaches that adjusting the curvature of the lens to adjust the focal depths of the lens according the wavelength of light (see also col. 5,lines 49-67). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made the focal lengths can differ for the first and second lens to correspond to the different wavelengths, since Tokumitsu teaches this lens design with the abutting micro lens array reduces smear and noise.

Regarding claim 6, Shizukuishi discloses a micro-lens array, comprising:

a first set of micro-lenses (12G) comprising a plurality of first micro-lenses;

a second set of micro-lenses (12B) comprising a plurality of second micro-lenses; and

a third set of micro-lenses (12R) comprising a plurality of third micro-lenses; wherein said first micro-lenses at least abut said second and third micro-lenses (see figure 1a; col. 3, lines 55-63; col. 5, lines 5-12; col. 6, lines 5-10). Shizukuishi patterns the lenses in the form to cover as much area on the array as possible. Shizukuishi illustrates the lens contact each other and some overlap. However, Shizukuishi fails to specifically disclose an embodiment where the lenses abut without overlapping as claimed.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lenses are patterned on the substrate to abut such that first and second lens, which are spectrally different, will contact (see col. 5, lines 25-65 and col. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hokari, as taught by Tokumitsu, since Tokumitsu teaches a pattering method for forming the micro lenses

that contact without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 7, Shizukuishi discloses the micro-lens array of claim 6, wherein said first micro-lenses have a first size and said second micro-lenses have a second size, said second size being no smaller than said first size (Shizukuishi teaches the micro lenses are only spectrally differentiated-see col. 11, lines 35-45-see figure 1a).

Regarding claim 8, Shizukuishi discloses the lens array is only differentiated by a spectral characteristic (transmission of certain wavelengths) and sensitivities of the lens can be adjusted (see col. 11, lines 38-45). Shizukuishi fails to specifically disclose the micro-lens array of claim 6, wherein said first, second, and third micro-lenses each have approximately a same focal length.

Tokumitsu teaches that the focal depth is dependent upon lens curvature (see col. 6,lines 1-15). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made that focal lengths of the first, second and third are approximately equal, if the lens array curvature is not differentiated. Further, designing the focal lengths of the lenses would been obvious to one ordinary skill in the art, since it is well known optical properties in micro lens design as taught by Tokumitsu.

Regarding claim 9, Shizukuishi discloses the lens array is only differentiated by a spectral characteristic (transmission of certain wavelengths) in on embodiment but in another embodiment the sensitivities of the lens can be adjusted (see col. 11, lines 38-45). However, Shizukuishi fails to specifically disclose the micro-lens array of claim 6, wherein a focal length of each of said plurality of first micro-lenses corresponds to a first

wavelength of light, wherein a focal length of each of said plurality of second micro-lenses corresponds to a second wavelength of light, and wherein a focal length of each of said plurality of third micro-lenses corresponds to a third wavelength of light.

Tokumitsu teaches that the focal depth is dependent upon lens curvature (see col. 6,lines 1-25). Tokumitsu also teaches that adjusting the lens curvature to adjust the focal depths of the lens according the wavelength of light (see also col. 5,lines 49-67). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made the focal lengths of the first, second and third lens correspond the different wavelengths, since Tokumitsu teaches the lens design with the abutting micro lens array reduces smear and noise. Further, the focal lengths of the lenses would been obvious to one ordinary skill in the art, since it is well known optical property in micro lens design for color imaging, as taught by Tokumitsu (assuring that the light is focused on the pixel site and not lost in the layers).

Regarding claim 11, Shizukuishi discloses the micro-lens array of claim 6, wherein said first, second and third sizes are equal to each other (Shizukuishi teaches the micro lenses are only spectrally differentiated-see col. 11, lines 35-45).

Regarding claim 12, Shizukuishi discloses a micro-lens array, comprising:

a first set of micro-lenses comprising a plurality of first micro-lenses (for example 12G);

a second set of micro-lenses comprising a plurality of second micro- lenses (for example 12B);

wherein said first micro-lenses exhibit different optical transmission properties than said second micro-lenses (see col. 4, lines 3-10). Shizukuishi patterns the lenses in the form

to cover as much area on the array as possible. Shizukuishi illustrates the lens contact each other and some overlap. However, Shizukuishi fails to specifically disclose an embodiment where the lenses abut without overlapping as claimed.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lenses are patterned on the substrate to abut such that first and second lens, which are spectrally different, will contact(see col. 5, lines 25-65 and col. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Shizukuishi, as taught by Tokumitsu, since Tokumitsu teaches a pattering method for forming the micro lenses that contact without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 13, Shizukuishi discloses the micro-lens array of claim 12, comprising a third set of micro- lenses comprising a plurality of third micro-lenses (for example 12R;see col. 4,lines 3-10).

Regarding claim 14, Shizukuishi discloses the micro-lens array of claim 13, wherein said third micro-lenses exhibit different optical transmission properties than at least one of said first and second micro-lenses (Shizukuishi discloses the each lens receives/transmits a different color band –see col. 4, lines 3-10).

Regarding claim 15, Shizukuishi discloses the micro-lens array of claim 14, wherein said third micro-lenses exhibit different optical transmission properties than both said first and second micro-lenses (Shizukuishi discloses the each lens receives/transmits a different color band –see col. 4, lines 3-10).

Regarding claim 16, Shizukuishi discloses the micro-lens array of claim 13, wherein said first micro-lenses abut said second and third micro-lenses (see figure 1a for example).

Regarding claim 36, Shizukuishi discloses a semiconductor-based imager, comprising:

a substrate having pixel cells formed thereon, each with a photo sensor (see col. 6, lines 20-43);

a micro-lens array (12), comprising:

a first set of micro-lenses comprising a plurality of first micro-lenses each having a first size (12B); and

a second set of micro-lenses comprising a plurality of second micro-lenses each having a second size no small than the first (12G- Shizukuishi teaches the lenses are only spectrally differentiated);

wherein said second micro-lenses are each positioned in a space between adjacent said first micro-lenses such that said second micro-lenses contact said first micro-lenses (see figure 1a). Shizukuishi patterns the lenses in the form to cover as much area on the array as possible. Shizukuishi illustrates the lens contact each other and some overlap. However, Shizukuishi fails to specifically disclose an embodiment where the lenses abut without overlapping as claimed.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lenses are patterned on the substrate to abut such that first and second lens, which are spectrally different, will contact (see col. 5, lines 25-65 and col. 6). Thus, it would have been obvious to one of

ordinary skill in the art at the time the invention was made to modify Shizukuishi, as taught by Tokumitsu, since Tokumitsu teaches a pattering method for forming the micro lenses that contact without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 37, Shizukuishi discloses the semiconductor-based imager of claim 36, further comprising a color filter array (9) positioned over said pixel cells-Shizukuishi teaches a color filter can be used with a spectrally differentiated micro lens- see figure 7 for example.

Regarding claim 38, Shizukuishi discloses the semiconductor-based imager of claim 37, wherein said color filter array (9) is positioned between said micro-lens array (12) and said wafer (1).

Regarding claim 39,

Regarding claims 40-41, Shizukuishi discloses the semiconductor-based imager of claim 36. Shizukuishi discloses the lens array is only differentiated by a spectral characteristic (transmission of certain wavelengths) and sensitivities of the lens can be adjusted (see col. 11, lines 38-45). Shizukuishi fails to specifically disclose the micro-lens array of claim 36, wherein said first and said second micro-lenses each exhibit a similar focal length.

Tokumitsu teaches that the focal depth is dependent upon lens curvature (see col. 6,lines 1-15). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made that focal lengths of the first, second and third are approximately equal, if the lens array curvature is not differentiated. Further, designing

the focal lengths of the lenses would been obvious to one ordinary skill in the art, since it is well known optical properties in micro lens design as taught by Tokumitsu.

Regarding claim 42, Shizukuishi fails to specifically disclose the semiconductor-based imager of claim 36, wherein a focal length of the plurality of first micro-lenses is adjusted for a first color signal, and wherein a focal length of the plurality of second micro-lenses is adjusted for a second color signal.

Tokumitsu teaches that the focal depth is dependent upon lens curvature (see col. 6,lines 1-25). Tokumitsu also teaches that adjusting the curvature of the lens to adjust the focal depths of the lens according the wavelength of light (see also col. 5,lines 49-67). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made the focal lengths can differ for the first and second lens to correspond to the different wavelengths, since Tokumitsu teaches this lens design with the abutting micro lens array reduces smear and noise.

Regarding claim 43, Shizukuishi discloses the semiconductor-based imager of claim 36; wherein a respective one of said second micro-lenses overlaps (12G) surrounding ones of said first micro-lenses (12B;see figure 1a).

Regarding claim 44, Shizukuishi discloses the semiconductor-based imager of claim 36, wherein said micro-lens array further comprises a third plurality of third micro-lenses each having a third size (12R).

Regarding claim 45, Shizukuishi discloses the semiconductor-based imager of claim 44, wherein said first, second, and third sizes are equal (Shizukuishi teaches the micro lenses are only spectrally differentiated-see col. 11, lines 35-45).

9. Claims 17-27,30-35,56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hokari (US 5,493,143) in view of Tokumitsu (US 5,238,856). Regarding claims 17,19 and 21, Hokari discloses a semiconductor-based imager comprising:

A pixel array having embedded pixels cells (see figure 5 for example) and a micro-lens array (9); a micro-lens array comprising:

A first set of micro lenses has a first size (green; see figure 9);

A second set of micro lenses (blue) has a second size;

Wherein the micro-lens array is close between the plurality of first micro-lenses and at least one of the second micro lenses. Hokari fails to specifically disclose the semiconductor-based imager includes a wherein the micro-lens array that is approximately space-less between at least one of the first and second micro-lenses.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lenses are patterned on the substrate to abut such that first and second lens, which are spectrally different, will contact or overlap (see col. 5, lines 25-65 and col. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hokari, as taught by Tokumitsu, since Tokumitsu teaches a pattering method for forming the micro

lenses without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 18, Hokari illustrates the first size (green) is different and would receive a greater amount of light than the second size (blue)- see figure 9 for example.

Regarding claim 20, Hokari discloses a third set of micro-lenses having a third size (see figure 9; red).

Regarding claim 22, Hokari illustrates in the embodiment of figure 9, equal focal lengths (focused to the same depths in the substrate).

Regarding claim 23, Hokari illustrates in the embodiment of figure 8, adjusting the curvature according to the color.

Regarding claim 24, Hokari discloses a semiconductor-based imager, comprising:

a substrate (1) having pixel cells formed thereon (see col. 3, lines 40-50), each with a see (2);

a micro-lens array (9), comprising:

a first plurality of first micro-lenses each having a first size (for example 9G); and

a second plurality of second micro-lenses each having a second size (for example 9R-height or 9B-surface area; see col. 6, lines 40-61) larger than said first size (9G-see figures 8-11);

wherein said second micro-lenses (for example 9B) are adapted to collect a greater amount of light than said first micro-lenses (9G- the Blue lens is larger surface area-see for example figure 11). Hokari fails to specifically disclose the semiconductor-based

imager of claim 24, wherein at least one of said second micro-lenses abuts at least one of said first micro-lenses.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lenses are patterned on the substrate to abut such that first and second lens, which are spectrally different, will contact (see col. 5, lines 25-65 and col. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hokari, as taught by Tokumitsu, since Tokumitsu teaches a pattering method for forming the micro lenses without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 25, Hokari discloses the semiconductor-based imager of claim 24, wherein said first (9G) and said second (for example 9B) micro-lenses each exhibit a similar focal length (In one embodiment, the micro lens material is wavelength selective and the light for individual wavelengths are focused at the photo sensor- see figures 9, 10e and 11- col. 5,lines and 15-20 and 50-55).

Regarding claim 26, Hokari discloses the semiconductor-based imager of claim 25, wherein said focal length extends to said photo sensors (see figure 9 and col. 5, lines 15-20).

Regarding claim 27, Hokari discloses the semiconductor-based imager of claim 24, wherein a focal length of the plurality of first micro-lenses is adjusted for a first color signal, and wherein a focal length of the plurality of second micro-lenses is adjusted for

a second color signal (In the embodiment of figure 8, each lens had a different curvature and thickness-see col. 5, lines 25-50).

Regarding claim 30, Hokari discloses the semiconductor-based imager of claim 24, further comprising a color filter array (20G, 20R, 20B) positioned over said pixel cells (see figure 9; col. 5,lines 55-65).

Regarding claim 31, Hokari discloses the semiconductor-based imager of claim 30, wherein said color filter (20G, 20R, 20B) array is positioned between said micro-lens array (9) and said wafer (1).

Regarding claim 32, Hokari discloses the semiconductor-based imager of claim 24, further comprising a light shield (7) positioned between said micro-lens array (9) and said wafer (1).

Regarding claim 33, Hokari discloses the semiconductor-based imager of claim 24, wherein said micro-lens array further comprises a third plurality of third micro-lenses each having a third size (for example 12 R).

Regarding claim 34, Hokari discloses a semiconductor image where the micro-lenses have different curvatures for each wavelength. Hokari fails to specifically disclose an embodiment where the first and third sizes are equal. Although, Hokari teaches that adjusting the sensitivity to the light of different wavelengths by changing the curvature and size of the lenses is common practice to adjust the output signal levels (see col. 4 for example). Tokumitsu also teaches using different curvatures to affect the light amount. Thus, Hokari and Tokumitsu disclose the claimed invention with the exception of two lenses having the same size as claimed. It would have been obvious to one of

ordinary skill in the art to have the first and second size equal, when balancing color out to in primary color system because a wavelength of light may be more present than the other.

Regarding claim 35, Hokari fails to specifically disclose the semiconductor-based imager of claim 33, wherein at least one of said first micro-lenses abuts at least one of said second micro-lenses and at least one of said third micro-lenses.

Tokumitsu teaches a color imaging using micro lenses with different curvatures to increase the amount of light entering a photo sensor. The lens are patterned on the substrate to abut such that first, second and third lens which are spectrally different will contact or overlap (see col. 5, lines 25-65 and col. 6). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Hokari, as taught by Tokumitsu, since Tokumitsu teaches a pattering method for forming the micro lenses without wasteful gaps on the substrate and such design in color imagers allows for a reduction in smear and its related noise.

Regarding claim 56, Hokari discloses a semiconductor image where the micro-lenses have different curvatures for each wavelength. Hokari fails to specifically disclose an embodiment where the second and third sizes are equal. Although, Hokari teaches that adjusting the sensitivity to the light of different wavelengths by changing the curvature and size of the lenses is common practice to adjust the output signal levels (see col. 4 for example). Tokumitsu also teaches using different curvatures to affect the light amount. Thus, Hokari and Tokumitsu disclose the claimed invention with the exception of two lenses having the same size as claimed. It would have been obvious to one of

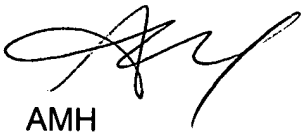
ordinary skill in the art to have the second and third size equal, when balancing color out to in primary color system because a wavelength of light may be more present than the other.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alicia M. Harrington whose telephone number is 571 272 2330. The examiner can normally be reached on Monday - Thursday 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 571 272 2328. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



AMH

Alicia M Harrington
Examiner
Art Unit 2873